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THE FINANCING OF COMPLEMENTARY CURRENCIES: PROBLEMS AND PERSPECTIVES

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ABSTRACT

Costs and cost coverage of complementary currencies has been neglected by researchers so far. This article provides an analysis of the different types of costs incurred and asks for appropriate means of financing such projects. External public and private sources are discussed in a critical manner. Self-financing appears to be a viable alternative; however, considering overall transaction costs, the burden to be carried by participants is considered to be a significant constraint with regard to this source. In the final part the question is discussed whether and how it can be possible to finance regional currencies that would have a significant economic impact. A scenario illustrates the potential of this feature with regard to the construction of new types of systems.

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1. INTRODUCTION

The financing of complementary currencies has only become a prominent issue in the recent past. Blanc and Fare (2013: 68-70) show that third- and fourth-generation systems can only prosper in close cooperation with local governments and administrations and with financial backing from a variety of different sources. Kennedy, Lietaer and Rogers (2012) describe a number of examples of such currencies. In order to become a partner of institutional actors in the social sector or the business community they ought to have professional management, normally paid staff. With a few exceptions such systems have not mushroomed so far. The bulk of all complementary or community currencies are first-generation systems (Seyfang and Longhurst 2013). Many of these were designed on the basis of the LETS model, but focus on private-to-private exchanges and, in contrast to the original LETS, use time as a measure of value. The author of this paper worked for such an organisation. This experience provided some of the motivation to write this contribution.

This article investigates the nature of this problem and discusses possible solutions. More specifically, the following questions are dealt with: What do cost structures of complementary currencies look like and how is it possible to match these requirements with appropriate financial schemes? These questions will be answered in three steps: The following section provides an overview of the "experiences" in different kinds of alternative currency systems. This forms a basis for the "analysis" of the different types of costs incurred in the third section. The first part of section 4, titled "perspectives", critically appraises conventional solutions, i.e. the different forms of external financing. Is it really possible to create complementary currency systems that will constitute a viable economic alternative? The author presents a possibility in the form of a scenario.

The findings of this paper are not based on a distinctive and original empirical survey. Instead, the author assembled data published about different types of systems and, in addition, made use of "grey" literature, i. e. documents produced by different complementary currency systems. This provides the basis for an understanding of the costs incurred or, to put it more generally, the effort necessary to launch and maintain trading in such systems. The material is structured by applying methods used in accounting and finance. This contribution should be considered as a first approximation to this issue. The empirical basis is still too thin to draw definite conclusions. The wide-angle approach pursued here, i.e. the comparison of the financial requirements of different types of systems means that some aspects are not discussed in detail.

2. ANALYSIS

2.1 Organisational characteristics of first generation systems

The author participated in the organisational work of a German Tauschring (founded in 1995) during the years

from 2000 to 2006. Most of this was unpaid work with a small remuneration in "Talents" covered by member fees. It might be questioned whether such a contribution to the organisation of a "social club" (Schroeder 2002: 9) can really be considered as "work". According to the ruling concept of economic rationality activities are either costs or benefits, a concept which is of very limited use in this context. Sometimes the "job" was very remunerating, sometimes it meant hard work. The principal lesson of this experience was that the quantity and quality of work necessary not just to launch such an organisation, but to keep it going is quite substantial. Of course, it should be critically assessed whether this personal account of the author is representative. At least, there is some evidence from activists of similar organisations (see Hood 1998: for instance 117 about a French SEL) that points in the same direction.

This kind of experience has not been adequately reflected in the academic literature. (For a systematic analysis of the empirical literature on the basis of 201 contributions see Schroeder, Miyazaki, Fare 2011: 38.) Usually, empirical studies ignore this aspect completely. North touches on the issue and concludes that "a fairly complex organisation was required to keep the LETS system in operation. Organising Manchester LETS involved some forty people and some 150 hours of work every two months. Members were paid six Bobbins an hour for administrative tasks ..." (North 2006: 67). This observation does not reflect the dynamic character of such organisations. They have to adapt themselves to new challenges. Bad debts, for instance, were not considered to be a problem in the beginning, later this changed and many of these organisations modified their accounting procedures to monitor this issue. New members might join the team and come up with new ideas. Maybe, they propose to implement new technologies, which might be the beginning of an interesting, but laborious process. Conflicts among organisers which have to be resolved are another example, certainly, not a pleasant part of any work. (This aspect has been neglected by researchers so far; see in this context Hood, 1998: 86f, 117.) All this is certainly not only a matter of how to organise structures and procedures in an efficient manner; it is, first of all, a question of adequate resources.

Many of the small community currencies, most of them being founded before the turn of the century, face the dilemma that they already need a relatively complex organisational structure, but lack appropriate resources. The desire of many activists to maintain their autonomy hinders them from asking for public support (for the French SEL see Lenzi 2006: 263, quoted in Blanc, Fare 2013: 73). In recent years many of these systems were in decline (Seyfang and Longhurst 2013), but, the author of this paper has the impression that, at least in Germany, this trend has come to a halt. It would require relatively small amounts of public subsidies to update the techniques to run these very small-scale systems – to develop, for instance, appropriate software and new manuals or to clarify certain legal issues (Schroeder 2007).

2.2. Complementary currencies as economic alternatives – early attempts

A major motivation for Michael Linton in founding LETS (perhaps the most successful blueprint in this field) in 1983 was to provide an alternative for a local business community. Later Linton dissociated himself from the small LETS schemes which had mushroomed in Britain in the early nineties. In 1994, he used an inheritance to provide the start-up capital for LETSGo. Here, he tried to involve large-scale businesses. The venture failed (see North 2006: 68-72). Other experiments to build up an economic alternative on the basis of the LETS model shared the same fate (see for instance i. r. o. New Zealand North 2007: 126-148, i.r.o. Australia Williams 1997, i.r.o. a German Tauschring in Freiburg Betz 2000). However, the reservation must be made, that a number of factors may have contributed to the breakdown of these projects.

Ithaca Hours, founded in upstate New York in 1991 departed from the concept of book money and issued its own paper currency. This facilitated payment processes. In addition, the pictures of "alternative money" might have contributed to the popularity of the scheme. However, it did not prove to be a successful blueprint for other initiatives of that kind (see Collom 2005). A case study written by Kirschner, a former organiser of such a scheme provides interesting evidence: She concludes that although the "lack of success (was supposed) to be some combination of organizational factors in fact all the struggles with staffing, funding, circulation, and membership all stemmed from how the currency was put into circulation" (Kirschner 2011: 53). One of the "lessons learned" is: "Paper currencies are expensive and hard to administer" (Kirschner 2011: 54).

Another example of systems that issued printed notes are the Argentine Trueque organisations. They are the only complementary currencies which were of economic importance at least for a short period of time. After the established capitalist economy had crashed about 2.5 million participants took part in these alternative trading markets. This figure was recorded in the first half of 2002, it had dropped dramatically already by 2003 to a level of 250,000 members (Gómez 2009: 107). The reasons for this failure has been researched in great detail by Gómez (2009: for a summary see 188). One aspect was that overall costs were not adequately covered. Beside expenditures for organisation Gómez mentions in this context the loss of trust due to large scale forgery of créditos, the cash notes issued in particular by the largest network, Red Global de Trueque (RGT). Other networks and the smaller local groups had more efficient administrative structures to cope with this problem. Apart from qualitative issues like adequate forms of governance it is noteworthy that the cash flow structure in particular of the RGT was completely inadequate. Income was generated mainly through seigniorage, i. e. the difference between the costs of producing credit notes and the higher price charged for selling them to members (Gómez 2009: 140f, also 135). This income accrued when new members joined the organisation, in particular during

the upsurge of the movement from the end of 2001 until mid 2003. However, a large part of these revenues were not invested to strengthen the organisation, but distributed among participants in goods and services (Gómez 2009: 141). Later, this source ran dry. A demurrage, a fee for holders of cash was introduced, but it proved to be too complicated and did not compensate the losses (Gómez 2009: 137). The basic structural problem of Trueque was already evident back in the nineties. "As new and unknown participants joined, the costs of running the system started to rise" (Gómez 2009: 89). The initial structure did not provide the base to develop an administration that could keep pace with a fast growing organisation.

2.3. Regional currencies – a fresh start in the 21st century

In 2004 Kennedy and Lietaer published an outline for new regional currencies in German. They considered it to be necessary to reach a size in the range of between 10,000 and 1 Million participants (Kennedy and Lietaer 2004: 77). The most successful organisation of this type in Germany is the Chiemgauer. After almost ten years this network had, at the end of the year 2012, 3,454 members. The organisation depends mainly on voluntary work (65%) and donations (5%). Paid services of the Chiemgauer co-operative only yield 30% of the income. Subsidies have never been an important source of income, in recent years they did not play any role at all (see Chiemgauer-Statistik 2003 - 2012 (as at 1.1.2013) by C. Gelleri for the Chiemgauer e. V.–http://www.chiemgauer.info/uploads/media/Chiemgauer-Statistik_01.pdf (retrieved 18.3.2013)). Compared to other experiments the Chiemgauer was quite successful.

This may also be explained by the fact that it departed from the principle of non-convertibility as applied in closed systems like LETS or the Swiss WIR Bank (Gelleri 2009: 66f). Generally, the latter systems face the problem that the relation between supply and demand tends to be unbalanced (see for instance Hubert 2004: 43-145 in her analysis of the German Tauschrings). This implies that a) for participants with a surplus the temptation is to break the rules and convert their credits into ordinary currency (see in respect of the Swiss WIR system Lautner 1964: 53 and Heim 2003), b) participants with a notorious deficit cause a bad debt problem (see Jackson 1997 about the failure of Australian LETS). Bad debts as well as the management of this problem are significant cost factors. For the Chiemgauer this is not an issue. Consumers acquire regional money against Euro currency which flows into a fund that guarantees the credibility of the system. Business people can, against a fee, change the regional money back into Euro currency. Gelleri himself considers the Chiemgauer as a first step to create regional cycles (Gelleri 2009). However, it appears that this type of a complementary currency facilitates the development of trading chains but not of trading cycles.

The Chiemgauer operates in an area which is rather wealthy (Thiel 2011: 253; Gelleri himself, 2009: 66, emphasizes to "choose a town or municipality with optimal preconditions" for projects). Other Regiogeld systems in

Germany tried to implement economic circuits by giving private participants the possibility to earn credits (see for instance Jansky 2009; with regard to the “challenge of re-circulation” see also North 2010: 137). Such systems are not based on the value of the Euro, but on the services provided by their members. They are more complex and it appears, that it is more costly to administer them.

After about ten years of development the Regiogeld movement is far from its objective to provide a substantial economic alternative (as claimed by Kennedy and Lietaer 2004: 77). A brief survey of the websites of Regiogeld systems indicates that they only reached a symbolic significance. (Access via a map and links on the website of Regiogeld e. V., <http://regionetzwerk.blogspot.de/> (retrieved 27.4.2013), see also Rösl 2006: 33). The Chiemgauer is an interesting experiment, but its value as a blueprint for other initiatives is rather limited. The model is based on conditions which do not exist elsewhere: Other regions offer a less favourable environment for such an experiment. Christian Gelleri was prepared to work full-time for a very small salary. A team of committed volunteers supported him, some of them highly qualified. It is not a matter of course that a team renders this service over many years without falling apart due to severe conflicts of objectives. The fact that the Chiemgauer spearheaded a movement and received media attention not just in Germany, but also in other parts of the world might have boosted the motivation of these actors and was perhaps helpful to get the support from other institutions.

2.4. Professional management and its problems

In contrast to the Chiemgauer, other regional currencies applied for public funding in order to become a reliable partner for the local business community and other partners in their area. This, however, did not lead to sustainable systems. An example is the Dessau model which comprised a barter-ring, a business-to-private facility and a kind of a “Tauschring” for private-to-private exchanges. The scheme was supported by means of the European “Equal” programme, but went bankrupt later. Rolf Walther, the manager of this project, emphasised the need of own resources and solid financing in order to cover operating costs (Contraste 2010: 6, see also the website of Anhalt Dessau AG, <http://www.dessau-ag.de/history.php> (retrieved 27.4.2013)).

In this context it is also noteworthy, that time banks have a long history of employing paid “time brokers”. There is evidence, both, from the USA and the UK that long-term funding of these projects is a problem (for the US see Collom et al. 2012: 182, for the UK see Seyfang and Smith 2002: 47). Just in times of economic crisis, i.e. when these organisations are most needed, “many in the non-profit world are struggling to survive” (Collom et al. 2012: 184). Organisers tend to get entangled “in a continual round of funding applications” (Seyfang, Smith 2002: 47, see also Gregory 2012: 97) and cannot devote their full attention to the actual tasks. This might also imply that organisers tend to identify themselves with the objectives imposed by the

funding organisation, objectives which are not necessarily identical with those of time bank participants. There is no clear empirical evidence which supports this last point. There are, however, indirect hints as to the gap between professionals and participants. Collom et al. (2012: 182) found that many time bank managers complain about the lack of member involvement. Generally speaking, there is some evidence in the literature about divergent interests of staff and participants in social enterprises (see for instance Kreutzer and Jäger 2011 and, also about other problems of social enterprises, Peattie and Morley 2008).

This discrepancy between the need to employ a highly professional management and to set up organisations on a going concern basis is most evident in complex systems like NU Spaarpas (for a description of this model see Sambeek and Kampers 2004, in respect of funding sources and duration see sections 1.4 and 1.5) and the French SOL. Both systems pursued or pursue an array of objectives, many of them within the framework of sustainability. This qualified them to receive substantial subsidies from high-powered funding resources, in particular the European Union. However, they did not meet the criterion of economic sustainability. The NU system was in operation in Rotterdam just between 2003 and 2004. SOL, despite substantial support, did not develop into a dynamic system (Blanc and Fare 2013: 75f; with regard to SOL the authors refer to M. Fare ‘Les conditions monétaires d’un développement local soutenable: des systèmes d’échange complémentaires aux monnaies subsidiaires’, PhD thesis in Economics, Université Lumière Lyon 2, France). Instead, Blanc and Fare (2013: 78) favour a model developed in Quebec – the Accorderie strives to maintain independence from governments by securing long-term funding from foundations (Blanc and Fare 2013: 78 and Fare 2009-2010: 10). Generally speaking, foundations are an important source of funding, in particular in North America. But they are also subject to constraints comparable to those of public authorities or the private sector. In recent years this became evident when their potential was reduced due to lower revenues from interest-bearing financial assets. In summary, it remains a challenge to secure not just external funding, but appropriate funding for complementary currency systems.

3. ANALYSIS: THE NATURE OF COST INCURRED

To run complementary currencies requires hardly any investment in assets. The challenge is to cover current costs, i. e. to generate a continuous cash flow in order to defray in particular the organisational costs of these entities. This implies expenditures for tools like computer equipment, renting of office space and assembly rooms or the acquisition of external expertise. Systems that use cash have to take into account the printing of counterfeit-proof money. By far, the most important item, however, are expenditures for administrative staff. It is beyond the scope of this paper to describe the various management tasks in such systems, especially as they differ from one type of a complementary currency to another. Certainly, an individual matching of

supply and demand, for instance by a “time broker”, is a significant cost factor.

It would be inappropriate to assume that after an initial investment a system can be administered at a reduced level of costs. Complementary Currencies are dynamic systems – if they do not adapt to changing demands, they will fade away (see Collom et al. 2012: 32-37 for an example of such a process of almost continuous reform, also Schroeder 2002: 4). This applies in particular in cases where systems experience significant growth (for the Argentinian Trueque systems, whose “success” swamped the organisations – see Gómez 2009). In the reverse case, i. e. when a system declines, it will probably become apparent that most of the costs are fixed costs. Obviously, payment of wages and incidental wage costs for an employed manager will – subject to contractual and legal conditions – have to be continued. Apart from that, most managerial functions will require the same amount of time. Even if, say, the preparation of a printed directory becomes a bit easier due to a reduced number of advertisements, this will be compensated by other tasks. Public relations work, for instance, might be intensified to stop the negative trend.

Costs may arise in legal tender and / or in the currency issued by the system. So far, systems run on a professional basis have to be financed in Dollar, Yen, Euro or other official currencies. An exception is the Chiemgauer as described above. This alternative money scheme depends, as almost all other systems, on the third “currency”, that is voluntary work. In principle, these economic considerations are also valid with regard to small and independent systems, where organisers get for their working time only a partial compensation in community currency (Schroeder 2002: 4).

Complementary currencies are usually organised as credit systems. Without going into the details of mutual-credit, service-credit or other systems, this aspect is relevant with regard to the present discussion, because a) credit monitoring is a significant part of managerial work and b) bad debts have to be written off. The latter constitutes another cost factor which had been underestimated for some time (see in this context Jackson 1997).

In order to get a comprehensive picture, it is necessary to go one step further and look at the overall transaction costs (for a short discussion of this concept and its theoretical background see Gómez 2009: 81-87). With regard to systems that operate mainly in the social sphere it may be doubted whether this theoretical framework is applicable. Certainly, searching for the right trading partner or getting in touch with him or her means an effort, but, apart from the product to be traded, the intrinsic benefit of community building in a “social club” (Schroeder 2002: 9) makes it worthwhile to carry this burden. This is different in systems which strive to provide a substantial economic alternative, even if they are interpreted as socially embedded economies as understood by Polanyi (1971). In addition to the above mentioned examples uncertainty about services rendered, conflict resolving or participation in meetings

can be considered as transaction costs. Thiel describes in detail how laborious it is to become a user of the Chiemgauer (Thiel 2011: 265- 283). North (2010: 138) describes the resistance of bookkeepers to implement a second layer of accounts which would be necessary to record transactions in local money. Some of these costs would probably decrease over time. A new bookkeeping system would become a routine after a while. If the system grew, its density would increase, and it would not be necessary to spend time and money to go, for instance, to a hairdresser in another part of the city, because the one next door is also joining the system. It seems that organisers usually proceed from the assumption that their initial efforts will trigger a self-enhancing process and propel the newly launched systems into the economies of scale (Gelleri 2008: 182). So far, complementary currencies have not reached take-off point. A major explanation of this is the high level of transaction costs, in particular in the early days of a system.

4. PERSPECTIVES

4.1. Financial perspectives

In order to cover current costs, complementary currencies have to secure a continuous flow of income. These financial means also have to be available when the established capitalist economy is in recession. (For the anti-cyclical nature of the business cycle in complementary currencies see the study of the Swiss WIR system by Stodder 2009.) External sources are hard to obtain in times when they are most needed. Crowd funding may be considered as a means to maintain the autonomy of a project (Warner, 2013). However, also this source does not provide a continuous flow of funds.

In recent years established institutional actors became increasingly interested in complementary currencies. The opportunities offered by new technologies like mobile payment may explain this interest. Certainly, new technologies promise to reduce transaction costs significantly, but, as pointed out above, this factor does not suffice to overcome the financial shortcomings. Taking into account that many of these social innovations are grass roots initiatives which developed their own objectives the question arises whether they can maintain these objectives as financially dependent organisations.

The European Union has provided funding for a number of complementary currency projects. The NU-Spaarpas, for instance, received such funding for its “sustainable incentive card scheme” (van Sambeek and Kampers, 2004, title; for the list of funding organisations see section 1.5). By now, we can observe, that the term “incentive” is used quite often to justify the establishment of community currency schemes (for example by Ikeda and Richey, 2012, p. 106f, Naughton-Doe, 2011, p. 75, Seyfang and Smith, pp. 16, 29, 44, 46, 47, 51, Deconinck et al., 2011). This is not necessarily bad, in particular if used in specific, often complex environments like the energy saving devices suggested by De-

coninck et al. (2011). However, with regard to other applications critical questions can be raised: Who is going to decide what constitutes sustainable behaviour? There are other cases that would allow the discussion of the ambivalent character of publicly funded alternative currencies. Of course, any case would require a detailed analysis, something that is beyond the framework of this paper. But to put a question mark here is certainly justified, also because such schemes have already been used as an instrument to implement neo-liberal policies (see Williams, 1997, about Australia, and North, 2007, pp. 126-148, about Green Dollars in New Zealand).

Whoever pays the bill calls the tune – this is also significant in respect of business-to-private networks carried by the commercial partners. Schroeder (2014b, section 6) criticises the careless attitude towards proposals that suggest flexible exchange rates (for instance by Boyle and Simms, 2009, 58). Regional currencies will have to campaign for appropriate legislation, but if successful, other actors might slip through the door and get their alternative exchange arrangements, systems, where it will be difficult to see that they pursue social and ecological objectives.

External funding will continue to be a financial source for complementary currencies. The challenge is to develop criteria that indicate gaps between the ideal and reality. “Sustainability” or, to take another example, “social and solidarity economy” sounds nice, but such concepts have remained rather vague, in particular if applied to complementary currencies. Schroeder (2014b, section 5) suggests interpreting these currencies not only as money systems, but as systems that operate within boundaries. This might provide a basis to evaluate such systems and see whether they meet their own standards. In cases where funding is guaranteed for a limited period, the going concern principle would require the formulation of a plan for the long-term future.

One is tempted to agree with Kennedy and Lietaer (2004: 130) that self-financing is the key to sustainability. But due to the high burden of transaction costs members cannot carry the burden of fees to finance the organisation of these systems. In the following section it will be demonstrated that it is possible to overcome the obstacles that have prevented complementary currencies from becoming economic alternatives.

4.2. A scenario of a “finite currency system”

First of all, a few introductory remarks may be useful to understand the characteristic features of scenarios. Certainly, they should not be confused with forecasts and they are not blueprints ready for implementation. (For details about scenario methodology see van Notten, 2004). The author of this paper is convinced that thinking about the future should not be restricted to trend prolongation. The following scenario is a creative attempt to sound the possibilities beyond the constraints described in previous sections.

The dual economy of the year 2029 was described by Flor in 1989. Regional markets complement the established capitalist economy. Transactions and income generated in these markets are exempted from conventional taxes. Instead, a levy is charged, which covers the expenses of the organisation that administers these new economic entities. Beside a spatial boundary the concept also has a time limit: The fiscal privilege applies only in as far as debits and credits are balanced over a year. A surplus or a deficit would be charged not only with income or value added tax, but, in addition, also with the regional levy. Therefore, these markets are not a lucrative instrument just for selling something. The author describes a number of other features which are not discussed here: a micro-financing scheme and the abolition of cash are just two examples.

In principle, the scenario offers a solution to the financing problem outlined in previous chapters. The fiscal privilege empowers the participants of the regional markets to become the carriers of these systems. However, the design of the dual economy implies two significant problems:

- Direct neighbours may not be able to use the regional markets together, because they are living on different sides of the border. But boundaries are often not strict lines, but zones that allow limited exchange within boundary zones. Thus, it would be possible to have overlapping regions, although this would make the concept somewhat more complex.
- The fiscal differences between the global and the regional economy makes it lucrative to resort to arbitrage. This cannot be completely avoided. However, as such a system grows, overall transaction costs – as described above – decrease and the difference might be reduced. In combination with a control system and sanctions this would keep the misuse of the system to a minimum.

Again, this is far from being a proposal that has been worked out in detail. It serves as a simple demonstration that new complementary currency models can be designed. Why should politicians grant a fiscal privilege to participants of such a system? To answer this question would require further research to appraise benefits and costs of such systems. But apart from the fact that many of the arguments put forward in favour of existing complementary currencies are applicable here (inter alia sustainable consumption on a local or regional level – Seyfang 2009, or resilience during recessions in the capitalist economy, as empirically shown by Stodder, 2009), it might be possible to put other lines of reasoning in the equation. Is there not a long history of granting economic privileges to certain actors or for certain spaces? Assuming that many of the goods traded in such a regional network would be the result of labour-intensive production, an analysis of potential trades within the framework of Baumol's cost disease (Baumol and Bowen, 1966) might reveal that persons who earn their money as, say, bicycles mechanics or hairdressers would be better off in such a system. Needless to say that the political process which is necessary to introduce

the legislative framework for these regional markets would be very complex.

5 SUMMARY

In this article it was shown that the present enthusiasm with regard to professionally managed systems is quite problematic from a financial point of view. Taking into account overall transaction costs complementary currencies which confine themselves to internal resources quickly reach their limits. On the hand, external funding increases administrative costs significantly and implies the risk that these currencies lose sight of their own objectives. If professionally managed systems depended just on "big government" and corporate interests they would lose of their innovative potential. The conclusion is that beside these elaborate schemes the so-called first-generation systems should not be put aside. Professionally managed schemes funded externally should be based on a long-term financial plan. Criteria have to be developed that indicate whether such systems meet their own standards. In addition, it is necessary to think about new types of systems that guarantee a certain level of autonomy from the existing institutional framework. Each and every course of action may be considered as "impossible"; the challenge is to overcome this "impossible".

The present state of complementary currencies may be compared to the development of aircraft around 1900. Some devices used in the late 19th century distantly resemble modern hanggliders. However, in order to create something like passenger aircraft as a means of mass transportation it will be necessary to come up with completely new solutions.

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